SYNTHESIS OF RESEARCH RESULTS

DREDGED MATERIAL RESEARCH PROGRAM

TECHNICAL REPORT DS-78-20

PRODUCTIVE LAND USE OF DREDGED MATERIAL CONTAINMENT AREAS: PLANNING AND IMPLEMENTATION CONSIDERATIONS

December 1978
Final Report

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This report synthesizes information from Task 5D of the U. S. Army Corps of Engineers' Dredged Material Research Program. This task examined the concept of using dredged material to create land and concurrently assessed the economic, technical, environmental, institutional, legal, and social incentives and constraints on the development of dredged material containment areas.

(Continued)

20. ABSTRACT (Continued).

The creation of productive land with dredged material is particularly attractive, because this option provides for the disposal of dredged material and additional benefits can be realized from the new land itself. This concept requires the planner/engineer to combine confined land disposal practices with sound land use planning for successful project implementation.

To help planners/engineers deal with the productive land use alternatives, the DMRP sought to identify critical items that should be addressed during the planning process. These items are physical planning elements encompassing the physical features of potential containment areas that affect project feasibility, land use planning principles that should guide planners in both disposal and subsequent use planning, and finally an overall set of implementation factors that provide a framework for ensuring that project planners address all concerns that affect project implementation.

Also contained are guides on the legal framework in which the Corps must work for successful land use of dredged material containment areas and on a system for economic evaluation of land created from disposal areas so that ultimate land use might be included in the final economic evaluation.

Finally the report delineates and discusses seven policy and five planning issues that must be resolved at the Corps' policy and planning development level if the Corps is to assume a more active role in disposal-productive use planning for containment areas.

SUMMARY

The use of dredged material from navigable waters as a manageable resource is an alternative to conventional disposal practices. The creation of productive land with dredged material is particularly attractive, because this option provides for the disposal of dredged material and additional benefits can be realized from the new land itself. This concept requires the planner/engineer to combine confined land disposal practices with sound land-use planning for successful project implementation.

Numerous examples of the creation of land with dredged material are scattered throughout the world. Indeed, it would be difficult to find a major coastal or inland port that has not used material dredged from harbors or waterways to create new land. Seven categories of land uses are defined based on functional use:

- Recreational
- Industrial/commercial
- Agricultural
- Institutional
- Material transfer
- Waterway related
- Multiple purpose

The existence of such a wide range of land uses of dredged material indicate that, under the right circumstances, dredged material can be used to create a valuable resource. The success of productive land-use as a dredged material disposal option depends on engineering and environmental, socioeconomic, and legal and institutional considerations and other site-specific constraints.

Engineering and Environmental Considerations

The development of a dredged material containment area for subsequent land use requires consideration of the engineering aspects of both the active disposal operation and the eventual site preparation for

subsequent use. The process for disposal and subsequent productive use includes six elements: project survey, dredging, transport, placement, conditioning, and site use. Each of these elements must be undertaken with the requirements of the specific land use in mind. Much of the research in the DMRP was directed toward providing information on the best means to accomplish the tasks within these elements to meet disposal objectives.

Environmental effects can be grouped according to physical, chemical, biological, and aesthetic impacts. There is essentially no difference in the primary environmental impact of conventional land disposal and that of new land creation for productive land use. However, secondary impacts from the type of development that occurs on the created land may be significant and must be considered.

For the most part the discussion of engineering and environmental considerations in this report is only a checklist of items for the planner/engineer. Cross referencing to specific DMRP reports that deal with topics in depth is included wherever possible.

Socioeconomic Considerations

The major socioeconomic consideration for the productive land-use option is whether any additional cost is more than balanced by the additional social and economic benefits. To aid in the evaluation of the benefits, a land-value methodology has been prepared. The methodology provides estimates of the direct market value of created land, related community benefits, and adverse impacts from the productive land use. Using the methodology and sound judgment, planners/engineers can gain more accurate estimates of the value of land created by using dredged material.

A total of 15 case study sites were examined to test the land-value methodology. Overall, the increases in land value resulting from the addition of dredged material in open water or on marginal land were high, but the wide range of such increases showed that value increase

is largely site specific and does not correlate well with general parameters. Associated benefits of creating land are important. As an example recreational land in urban areas is scarce; therefore, such land created with dredged material could fulfill a pressing social need.

Legal and Institutional Considerations

On the one hand, environmental legislation dictates an increase in confined land disposal of dredged material resulting in land creation, while on the other, many environmental and land-use laws prohibit the placement of dredged material in sensitive aquatic and lacustrine areas. This conflict is the result of a highly fluid legal framework that constantly adjusts to changing Federal, State, and local objectives. Federal law has defined the basic framework within which planners/engineers must work to dispose of dredged material by both conventional methods as well as using innovative land creation options. The most significant Federal legislation and their areas of impact are discussed in this report.

However, the primary responsibility for land-use control lies at the State and local level. Since the creation of new land with dredged material ultimately will involve land use, State laws and regulations can be restrictive. Constraints imposed by State laws can be categorized as procedural, substantive, and categorical in nature. On the local level comprehensive master plans, zoning, and floodplain management programs must be dealt with to achieve productive land use of dredged material.

Federal, State, and local legislation and the many institutions administering these laws make it difficult to form general conclusions about legality of the land-use option. Although much legislation may be tested in the courts, it is clear that the trend to State control over land use and environmental quality is strong and is increasing. The Corps must be ready to work with the states to develop effective plans for dredged material disposal.

Critical Planning Items

To help planners/engineers deal with the productive land-use alternative, the DMRP has sought to identify critical items that should be addressed during the planning process. These items are physical planning elements encompassing the physical features of potential containment areas that affect project feasibility, land use planning principles that should guide planners in both disposal and subsequent use planning, and finally an overall set of implementation factors that provide a framework for ensuring that project planners address all concerns that affect project implementation. When used in conjunction with the Corps multiobjective planning, these items can help to implement successful alternatives to conventional disposal.

Policy and Planning Issues

Overall, there are a number of policy and planning issues that must be addressed to enhance the land-use alternative to conventional disposal. Some of these issues can be addressed by the Corps District and Division offices; others will require attention at the national level. These policy and planning issues were developed after examination of the myriad of problems that impede the wide use of productive land-use options. Until they are addressed the productive land use of dredged material will not be fully realized. These issues are listed below.

Policy issues

1. Corps advocacy role in disposal-productive use planning.
2. Corps advisory role in disposal-productive use planning.
3. Evaluation criteria for disposal-productive use alternatives.
4. Financing of disposal-productive use projects.

5. Application of the "Principles and Standards"* and Corps multiobjective planning procedures to disposal-productive land use planning.

6. Expansion of Corps role in Corps-sponsor relationships for operations and management.

7. Legislative recognition of disposal-productive use concepts.

Planning issues

1. A multidisciplinary team approach to disposal planning by the Corps District offices.

2. Encourage more cooperative interagency/intergroup participation in planning disposal-productive use options.

3. Development and application of a holistic or systems approach to dredging-disposal-productive land use project planning.

4. Establishment of long-term, comprehensive regional plans for dredged material disposal-productive use alternatives.

5. Development of land-use planning expertise within the Corps.

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*U. S. Water Resources Council, "Water and Related Land Resources; Establishment of Principles and Standards for Planning," Federal Register, Vol 38, No. 174, Part III, Washington, D. C., 1973.

PREFACE

This report provides general guidance for planning and implementing the land use of dredged material containment areas. The basis for the report is the research conducted within Task 5D, "Disposal Area Land Use Concepts," of the Productive Uses Project (PUP) of the Dredged Material Research Program (DMRP). The DMRP was sponsored by the Office, Chief of Engineers, U. S. Army, and conducted by the Environmental Laboratory (EL) of the U. S. Army Engineer Waterways Experiment Station (WES).

Mr. Michael R. Walsh, Research Civil Engineer, and MAJ Mark D. Malkasian, CE, R&D Coordinator, prepared this report under the general supervision of Mr. Thomas R. Patin, Manager of the PUP, and Dr. John Harrison, Chief of EL. Dr. Roger T. Saucier and MAJ Robert Meccia, CE, were also Managers of the PUP during various stages of the research program. Extensive supplemental input to Parts VI and VII was provided by Mr. John Gushue, Program Manager, Energy Resources Company, Inc., Cambridge, Mass. This report is also being published as Engineer Manual 1110-2-5022.

During the preparation of this report, Director of WES was COL John L. Cannon, CE. Technical Director was Mr. F. R. Brown.

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U. S. customary units of measurement used in this report can be converted to metric (SI) units as follows:

Multiply	By	To Obtain
acres	4046.873	cubic metres
feet	0.3048	metres
miles (U. S. statute)	1.609344	kilometres

PRODUCTIVE LAND USE OF DREDGED MATERIAL CONTAINMENT AREAS: PLANNING AND IMPLEMENTATION CONSIDERATIONS

PART I: INTRODUCTION

Dredged Material as a Resource

1. The Dredged Material Research Program (DMRP) sought to determine the environmental impacts of dredged material disposal and, at the same time, develop alternatives to increase the beneficial and reduce the adverse effects of both land and water disposal. An attractive alternative, one explicit in the DMRP's objective statement, is the consideration of dredged material as a manageable resource. The use of dredged material as a resource is not a new idea. Rising interest in this alternative to conventional disposal practices is due to the fact that, while the amount of material dredged each year continues to rise, increasing urbanization around waterways and ports has made it difficult to locate new sites for dredged material containment areas. New environmental regulations have further restricted both land and water disposal options. As a result, the costs of dredged material disposal have increased rapidly as disposal sites are located at greater distances from the dredging site and environmental controls are added. In light of these conditions, the resource recovery of dredged material becomes a viable option. Thus, the beneficial use of dredged material was the major research thrust of the Productive Uses Project (PUP) of the DMRP.

2. By considering dredged material as a resource, a dual objective can be achieved. The dredged material from needed navigation projects can be disposed of with minimal environmental damage, and benefits can accrue from its use. One major beneficial use results from creating new land with dredged material. Almost any type of land use is possible on land created from dredged material. The Disposal Area Land Use (DALU) task of the PUP addressed the land use of dredged material containment areas as an alternative to conventional disposal.

3. The DALU task dealt with concepts for the ultimate use of dredged material containment areas. It would be very hard to find a major coastal or inland port that has not used material dredged from harbors or waterways to create new land for development. However, in most past cases where dredged material has been confined, little thought has been given to the subsequent land use of the containment area. Often the dredged material containment area has been left as a wasted resource, or development has been haphazard and out of harmony with nearby land use. Proper planning and management are needed to gain the greatest benefits from this use of dredged material.

4. The objectives of the DALU task were to identify concepts for the land use of dredged material containment areas and assess the incentives and constraints associated with implementing the concepts in the context of a dredging operation. Early in the conduct of the task it was discovered that, although there were many workable concepts, a complex web of factors affected their implementation. For example, the recreational use of land created from dredged material was a desirable alternative, but the economic, social, legal, institutional, and technical issues associated with such a project were sometimes formidable roadblocks to its development. Also, it was recognized that often the "softer" issues, i.e. economic, legal, social, and institutional, were more important than the technical issues in implementing a productive land use project.

5. Thus, while the task examined concepts, the major thrust of the research was to assess the socioeconomic, technical, institutional, legal, and policy incentives to and constraints on the development of dredged material containment areas for subsequent land use. The five research studies conducted under the DALU task each contributed to fulfilling the task objectives. Table 1 lists the research studies and the organizations performing the work. Appendix A contains abstracts from the reports for each study.

Table 1

Disposal Area Land Use Research Studies

Research Study	Performing Organization(s)
Land Use of Dredged Material Containment Areas: Productive Use Examples[1]	Environmental Laboratory, U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Miss., and Beeman and Benkendorf, Portland, Oreg.
Case Studies and Comparative Analyses of Issues Associated with Productive Land Use at Dredged Material Disposal Sites[2]	Energy Resources Company, Inc., Cambridge, Mass.
Socioeconomic Aspects of Dredged Material Disposal: The Creation of Recreation Land in Urban Areas[3]	Department of Environmental Sciences, University of Virginia, Charlottsville, Va.
Evaluation of Laws and Regulations Impacting the Land Use of Dredged Material Containment Areas[4]	Science Applications, Inc., LaJolla, Calif.
A Methodology for Determining Land Value and Associated Benefits Created from Dredged Material Containment[5]	SCS Engineers, Reston, Va.

Report Organization

6. Using the results of research conducted under the DALU task and selected studies from other parts of the DMRP, this synthesis report describes usable concepts for the land use of dredged material containment areas and discusses the important considerations that must be taken into account when planning and implementing disposal-productive use concepts. Corps personnel, dredging project sponsors, local agencies, and affected communities will find this report useful as a compendium of information on the complex set of factors that can affect the ultimate success or failure of a productive land use project.

7. Part II provides a description of functional categories of land use of dredged material containment areas. Selected examples are highlighted to give the reader an appreciation of the variety of productive land uses in existence.

8. Beginning with Part III and continuing through Part VI, the report discusses the legal, institutional, socioeconomic, technical, and planning considerations that affect land use of dredged material containment areas.

9. Part III deals with the technical considerations, describing the dredging-disposal system and its components and then the engineering and environmental factors associated with creating land from dredged material.

10. The socioeconomic aspects of productive land use of dredged material are discussed in Part IV. A brief description is given of a methodology for determining the land value and associated benefits and adverse impacts of dredged material containment areas. The implications of this methodology for planners are discussed.

11. Part V discusses the legal and institutional framework within which all work on the productive land use of containment areas must be accomplished. Relevant Federal, state, and local laws are examined, and an assessment of the implications of trends in the law is furnished.

12. Proper planning of disposal-productive land use projects is essential for their success. Part VI identifies physical planning elements that must be addressed in disposal-productive land use planning and land use planning principles for guiding subsequent use decisions. In addition, an overall set of implementation factors for disposal-productive land use projects is presented.

13. Finally, Part VII examines planning and policy issues affecting land use of dredged material containment areas and suggests areas where modification to present policy might enhance the productive land use alternative.